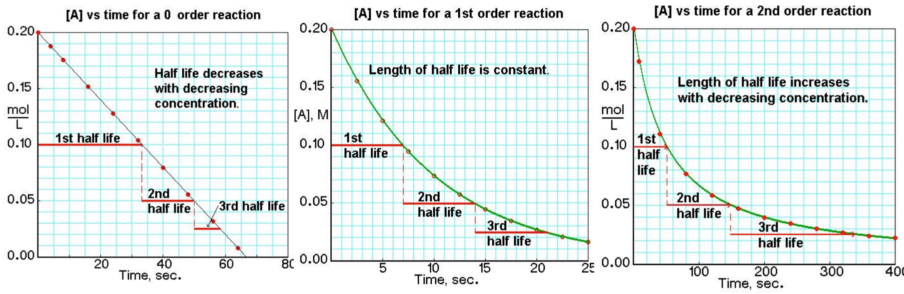
Assignment 12.2a p. 567 #3, 15, 31 – 43 odd, 72, 81a-c

3)



15) The order of the reactant is $^1/_2$. Rate increases with the square root of the reactant concentration.

If the order is -1 and the reactant increases concentration by 2, then the rate will be $^1/_2$ the initial rate (inversely proportional).

35) a. If the slope is already linear with a negative slope, this is zeroeth order

rate = k $[C_2H_5OH] = -kt + [C_2H_5OH]_o$ $k = 4.00 \times 10^{-5}$ mol/Ls

b. $t_{1/2} = \dfrac{[C_2H_5OH]_o}{2k} = \dfrac{[0.0125]}{2(4.00 \times 10^{-5})}$ **= 156 s**

c. Since it decays at a constant rate, it will take exactly 2 half-lives **(312 s)**

31) This is the initial graph of concentration vs. time.

It looks like 1st order so I will plot the natural log (ln).

When I replot with $\ln[H_2O_2]$ on the y-axis, I get a linear regression, so it is first order.

$\ln[H_2O_2] = -0.000835\ t$

$k = 0.000835\ s^{-1}$

Rate = $0.000835\ [H_2O_2]$

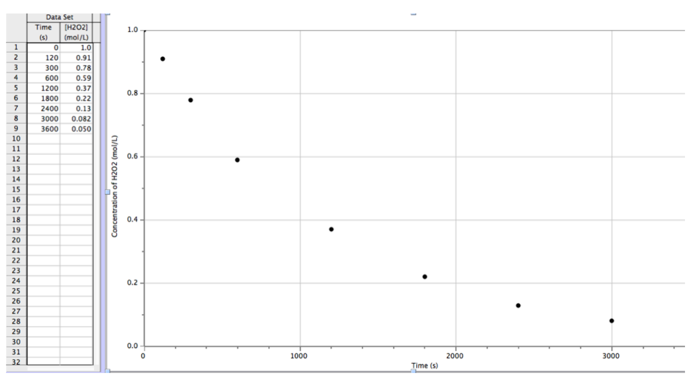
at 4000 s,

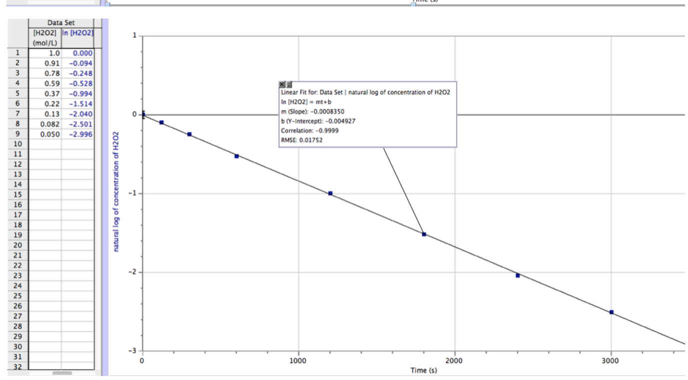
$\ln[H_2O_2] = -0.000835\ (4000)$

$\ln[H_2O_2] = -3.34$

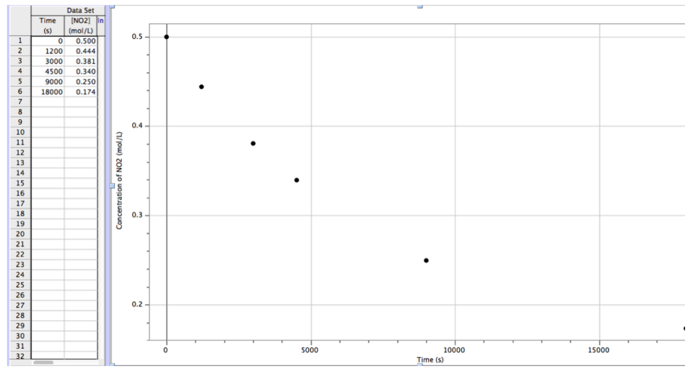
$[H_2O_2] = e^{-3.34}$

$[H_2O_2] = 0.035$ M



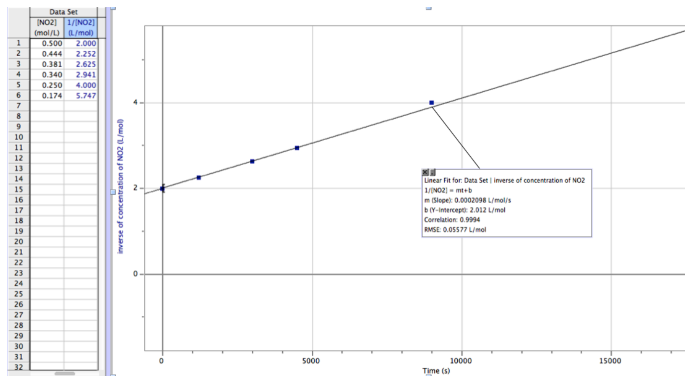


33) This is the initial graph of concentration vs. time.



It looks like 2nd order so I will replot the inverse.

When I replot with $1/[NO_2]$ on the y-axis, I get a linear regression, so it is 2nd order.



$1/[NO_2] = k\,t + 2$

$k = 0.000210$ L/mol s^{-1}

Rate = $0.000210\,[NO_2]^2$

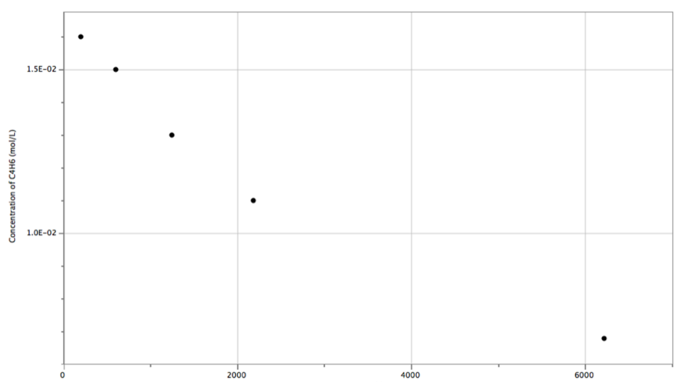
at 27,000 s,

$1/[NO_2] = 0.000210\,(27{,}000) + 2$

$1/[NO_2] = 7.67$

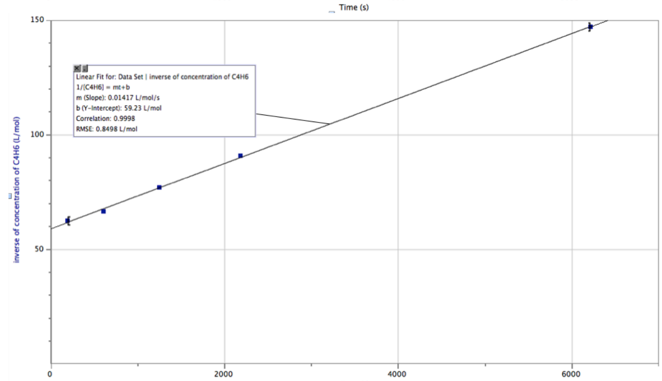
$[NO_2] = 0.130$

37) This is the initial graph of concentration vs. time.



It looks like 2nd order so I will replot the inverse.

When I replot with $1/[C_4H_6]$ on the y-axis, I get a linear regression, so it is 2nd order.



$1/[C_4H_6] = k\,t + 59.2$

or

$1/[C_4H_6] = k\,t + 1/[C_4H_6]_0$

Rate = $k\,[C_4H_6]^2$

$k = 0.0142$ L/mol s